

Appln. No.: 10/735,798
Amdt. dated June 7, 2005
Reply to Office action of March 11, 2005

LISTING OF CLAIMS:

1. (Original) A method of making a piston, comprising:

preparing a first portion of the piston having at least two associated circumferentially extending joining surfaces that are spaced from one another,

preparing a second portion of the piston having at least two associated circumferentially extending joining surfaces that are spaced from one another;

supporting the first and second piston portions with the joining surfaces of the first portion being positioned out of contact with the joining surfaces of the second portion;

heating the joining surfaces of the first and second portions to an elevated bonding temperature and thereafter bringing the joining surfaces of the first and second portions into contact with one another and thereby forming a metallurgical bond therebetween, wherein the joining surfaces lie in different planes.

2. (Original) The method of claim 1 wherein the joining surfaces are heated by induction heating.

3. (Original) The method of claim 2 wherein while the first and second piston portions are supported out of contact with one another, their respective joining surfaces are disposed in spaced relation to one another forming a gap between the forming surfaces of the first portion and the forming surfaces of the second portion.

4. (Original) The method of claim 3 wherein the induction heating is carried out by extending an induction coil into the gap and energizing the coil to heat the joining surfaces after which the coil is withdrawn from the gap before bringing the joining surfaces of the first and second portions into contact.

5. (Original) The method of claim 4 wherein during contact of the joining surfaces, the first

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and second portions are twisted relative to one another to slide the joining surfaces across one another.

6. (Original) The method of claim 5 wherein the twisting occurs over less than 360°.
7. (Original) The method of claim 5 wherein the twisting occurs over less than 180°.
8. (Original) The method of claim 5 wherein the twisting occurs over less than 90°.
9. (Original) The method of claim 5 wherein the twisting occurs over less than 45°.
10. (Original) The method of claim 5 wherein the twisting occurs over less than 30°.
11. (Original) The method of claim 5 wherein the twisting occurs over less than 20°.
12. (Original) The method of claim 5 wherein the twisting occurs over less than 10°.
13. (Original) The method of claim 5 wherein the twisting occurs over less than 5°.
14. (Original) The method of claim 4 including positioning the induction coil closer to the joining surfaces of one of the first and second portions than to the other of said joining surfaces.
15. (Original) The method of claim 14 including fabricating the first and second portions from different materials.
16. (Currently amended) The method of claim 1 including final machining a combustion bowl in the first portion and final machining pin bosses and pin bores in the second portion prior to heating and bonding of the joining surfaces.
17. (Original) The method of claim 1 wherein the resultant piston is provided with an induction weld joint in a ring belt of the piston, and locating the induction weld joint below the lowest of any ring grooves provided in the ring belt.

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18. (Original) The method of claim 1 including machining valve pockets in the first portion prior to heating and bonding with the second portion.

19. (Currently Amended) The method of claim 1 including forming the joining surface on mating wall sections of the first and second portions.

20. (Original) The method of claim 19 wherein the wall sections are annular.

21. (Original) The method of claim 20 wherein the joining surfaces are provided in necked down end regions of the wall sections.

22. (Original) The method of claim 1 wherein any heating required to elevate the temperature of the joining surfaces to the bonding temperature is discontinued prior to and after the joining surfaces are brought into contact with one another.

23. (Original) The method of claim 1 wherein an annular cooling gallery is formed between the first and second portions bounded by a pair of radically spaced side walls, a top wall, and a bottom wall.

24. (Original) The method of claim 23 wherein the joining surfaces are formed in the side walls such that a weld joint is formed in each side wall at the joining faces exposed to the cooling gallery.

25. (Original) The method of claim 1 wherein the first portion is formed with a combustion bowl and the second portion is formed with a pair of pin bosses and a piston skirt fixed immovably to the pin bosses.

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26. (Currently Amended) The method of claim 1 wherein the first portion is machined with features that are asymmetrical across a plane containing a longitudinal axis of the first portion[[s]].

27. (Original) A method of fabricating a piston comprising:

 fabricating a first piston portion having at least one associated mating surface;

 fabricating a second piston portion separately from the first piston portion having at least one associated mating surface;

 spacing the mating surface of the first piston portion from the mating surface of the second piston portion;

 with the mating surfaces spaced, heating the surfaces to a temperature sufficient for welding of the surfaces;

 bringing the heated mating surfaces into contact with one another to weld the piston portions across the joined mating surfaces, and, while the joined mating surfaces are still hot, pulling the piston portions axially away from one another to reduce the thickness of the mating surfaces.

28. (Original) The method of claim 27 wherein the joining surfaces are heated by induction heating.

29. (Original) The method of claim 27, including forming a cavity across the mating surfaces.

30. (Original) The method of claim 27, wherein following welding, the joined mating surfaces are further heat treated to back temper the joined mating surfaces.

31. (Currently Amended) A piston, comprising:

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an upper piston portion having at least one annular wall with a mating surfaces;
a lower piston portion having at least one annular wall with a mating surfaces; and
an induction a weld joint uniting said at least one annular mating surfaces, and
wherein the joined mating surfaces are locally thinned at the weld joint in the radial direction
relative to a radial dimension of said annular walls adjacent said weld joint, so as to define a
needed region at said weld joint on radially opposite sides of said walls.